

**APPENDIX B****TECHNICAL SUMMARY****MercuryMD, Inc.****August 12, 2000**

The following information is confidential and contains proprietary information including trade secrets of MercuryMD, Inc. Neither the document nor any of the information contained in the document may be reproduced or disclosed to any person under any circumstances without express written permission of MercuryMD, Inc.

**MercuryMD, Inc.**  
9 Forest Oaks Drive  
Durham NC 27705  
Tel: 877-747-7630  
Fax: 630-604-1416

**Principals:**

**William T. Lawson, MD**  
Home: 919-383-1767  
Cell: 919-812-4459  
Email: [william.lawson@mercurymd.com](mailto:william.lawson@mercurymd.com)

**Matthew Cross**  
Work: 512-707-1394  
Cell: 512-294-7256  
Email: [matt.cross@mercurymd.com](mailto:matt.cross@mercurymd.com)

**Alan J. Ying, MD**  
Home: 919-384-1530  
Page: 919-970-9077  
Email: [alan.ying@mercurymd.com](mailto:alan.ying@mercurymd.com)

**Travis Teague**  
Work: 512-707-1394  
Cell: 512-294-7256  
Email: [travis.teague@mercurymd.com](mailto:travis.teague@mercurymd.com)

## **TABLE OF CONTENTS**

### **Introduction**

### **Logical Architecture**

MInterface

MCentral

MConnect

MData

### **Physical Architecture**

Server

Synchronization Stations

## INTRODUCTION

The purpose of this document is to provide a technical overview of MercuryMD's clinical data distribution system. Our product vertically integrates patient care databases to handheld devices of individual medical practitioners (MD, PA, RN, etc) through a user-friendly interface that increases efficiency, reduces errors, and improves patient care.

## LOGICAL ARCHITECTURE

**MInterface.** MercuryMD's data distribution system does not replace existing legacy systems at any individual medical center. Indeed, most institutions have invested in a variety of systems from multiple vendors that serve needs such as ADT, laboratory data retrieval, radiology, dictation storage, and pharmacy. We provide a modular interface, MInterface, that sits aside these individual systems and assimilates information into our central database. MInterface is an ActiveX EXE built in Microsoft Visual Basic 6.0 that runs on our Windows 2000-based server. It is a database-driven service that relies on institution- or system-specific metadata to interpret coded data and insert it into our central database.

Typically, our system is provided user access by the host systems for secure authentication. All transactions between MInterface and external systems are logged in MCentral (see below). MInterface can be configured to function in a variety of modes: it can poll existing systems at regular time intervals, poll existing systems based on the knowledge that new data is available, or it can monitor a message stream and generate events to update our central database as necessary. Configuration of MInterface is performed by MercuryMD's implementation consultants in collaboration with technical personnel and vendors at each institution.

**MCentral.** Our relational database, MCentral, performs four tasks: 1) Maintain archive of clinical data on active patients; 2) Maintain knowledge of the state of all data on each user's handheld device; 3) Support user collaboration in patient care by supporting multi-user Teams that share patient data; and 4) Support the database-driven aspects of MInterface and MConduit. MCentral is currently implemented in Oracle 8i, however, the tables and views have been designed with portability in mind so that the database can be implemented in any enterprise-capable relational DBMS that is already supported and/or licensed by the institution.

MCentral's entity-relationship diagram is proprietary. However, MIS personnel at our institutional partners have read-only access to MCentral's data and structure subject to terms of our non-disclosure agreement. Such access will allow institutions to eventually integrate billing and diagnosis data collected by caregivers at the point of care. Access to MCentral is limited to that granted to our internal MInterface and MConduit systems and read-only access provided to authorized institutional administrators.

It is important to emphasize that MCentral is not a data repository. Patient data has a limited lifetime within our database, which implies that our database will asymptotically approach a maximum size dictated by the number of hospitalized patients. The lifetime of patient data is typically from 72 hours before the current hospital admission until 72 hours after discharge. For liability reasons, we do not currently replace any institutional data collection or archival systems.

While our user interface supports diagnostic coding and charge capture for inpatient services, this functionality is currently only in evaluation and not for permanent storage or institutional use.

**MConduit.** Our conduit technology has been licensed from Extended Systems ([www.extendedsystems.com](http://www.extendedsystems.com)) in the form of their XTNDConnect Server software. This software is a robust, scalable handheld device management platform that provides high-level synchronization design for multiple platforms. Additionally, it provides robust user management and security services for both database access and end-user synchronization. MConduit provides concurrent multi-user handheld synchronization services over any access modality (wired cradles, infrared, RF networks) that supports TCP-IP. This flexibility eliminates the requirements for workstation-driven synchronization software and reduces the cost of large-scale distribution.

MConduit and its integration with MCentral provide considerable speed advantages during synchronization. Since MCentral contains knowledge of the information state on each user's device, we only transfer changes between handheld and server during synchronization. So-called "delta synchronization" reduces synchronization time and is more efficient for server and network.

Data encryption during synchronization is not generally required if synchronization occurs within the confines of the institutional Intranet. However, if the institution desires to support Internet-based synchronization allowing users to connect from home using XTNDConnect's Proxy software, XTNDConnect provides 128-bit Certicom encryption for financial-grade data security.

MConduit is essential to our system's overall security model. It provides both device- and user-level authentication during synchronization and allows us to manage users internally or through existing Microsoft Exchange or Lotus Notes directory servers. Most importantly, MCentral controls all database connections with MCentral and eliminates the need for database-level user authentication.

**MData.** MData is our flagship program that runs on handheld devices running Palm OS 3.0 or greater. It is a C application that provides rapid data retrieval with a unique interface optimized for stylus-free use.

The most striking feature of MData besides its overall look and feel is the inherent support for team-based patient care. Users can aggregate into teams in the MCentral database, and all team members share rounding, diagnosis, allergy, and history information as entered by any individual. During synchronization, any users with the latest version of editable data are allowed to forward their changes to the server for subsequent sharing with other team members. In the event that the server data has changed underneath a user who has also made changes before synchronizing, a conflict resolution system alerts the user and allows him/her to choose between resubmitting the changes during the next synchronization or canceling the changes and accepting the latest data from the server.

MData also contains a number of additional features deemed essential by practicing residents and private practitioners: instant access to all the latest laboratory data, a patient-specific sketch field for freeform notes, automatic carry-forward of the previous day's notes to speed documentation, and an intuitive interface to support diagnosis and charge capture within the workflow of data retrieval and clinical decision making.

MData's Palm databases are automatically updated by the MConduit system during each synchronization. MData's Palm databases are packed in a binary format on the handheld, and unpacking these data requires *a priori* knowledge of our underlying table structure. We also prevent our databases from being copied to users' desktop computers during routine HotSync operations and prevent infrared transfer of our databases between devices.

A unique user login and a user-specified PIN of at least 4 numbers provide security for the MData application. The valid login must be entered at initial startup and must be present at each synchronization. Given user's needs to rapidly navigate between applications on their handheld device, we do not require PIN entry each time MData is launched. Instead, the user is required to enter his/her PIN if it has been at least 60 minutes since the last authentication.

## PHYSICAL ARCHITECTURE

**Server.** The server provided by MercuryMD is a Dell PowerEdge 2400 server with two 600MHz Pentium III processors and a three-drive 18-gigabyte RAID 5 array. The server runs Microsoft Windows 2000 and runs Oracle 8i for the MCentral database, our XTNDConnect MCentral conduit, and the MInterface application. It requires a fixed IP address either through direct network configuration or assignment of a fixed IP from a DHCP server through its NIC identifier. We also provide Norton PCAnywhere 9.2 for remote access and troubleshooting.

The server can either be physically located on the institution's backbone for maximum performance or it can reside in the MercuryMD server farm for access over the Internet. The NIC supports 100 megabit per second Ethernet connectivity.

**Synchronization Stations.** Synchronization services are currently provided using Clarinet hubs and IRDA transceivers ([www.clarinetsys.com](http://www.clarinetsys.com)) for wireless and cradle-free access. Each Synchronization Station consists of one Clarinet hub and seven IRDA transceivers arranged in a custom-designed box that holds the user's Palm devices during the synchronization process. The box itself takes up one by two feet of desk or table space and can support further storage (paper forms, supplies, etc.) on top of it. The station requires only one 120-volt wall outlet and one Ethernet connection for the hub.

The IRDA hub connects into the network and can either be manually assigned an IP address or automatically assigned an address from a DHCP server. The hub can also assign IP addresses to the IRDA transceivers manually or obtain IP addresses for each transceiver from a DHCP server. Configuration of the hub needs to occur only once, with specifications stored in non-volatile RAM before placement in the appropriate location.